



Airspace Technology Demonstration 2 (ATD-2)

Understand and Process ATC Restrictions in the National Airspace System

May 23, 2018

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- Keep broad group of ATD-2 stakeholders informed of progress in an inexpensive and unobtrusive manner
- Demonstrate actual system capability and lessons learned (as opposed to documents/plans)
- Take input from stakeholders that can be used to improve the ATD-2 system, processes and/or outreach
- Identify areas where more detailed discussion is desired/warranted

Go to https://www.aviationsystemsdivision.arc.nasa.gov/research/tactical/atd2_remote_demos.shtml to learn about upcoming ATD-2 remote demos!

ATD-2 Remote Demos

To Join...

1. Go to: <https://ac.arc.nasa.gov/atd2/>
Enter as a guest and type your name. NASA Employees can log-in with their email and password (NDC Credentials).
2. Dial the Telecon Number: **1-844-467-6272, Passcode: 592382#**

Demo Objectives

- Keep broad group of ATD-2 stakeholders informed of progress in an inexpensive and unobtrusive manner
- Demonstrate actual system capability and lessons learned (as opposed to documents/plans)
- Take input from stakeholders that can be used to improve the ATD-2 system, processes and/or outreach
- Identify areas where more detailed discussion is desired/warranted

Upcoming Demos

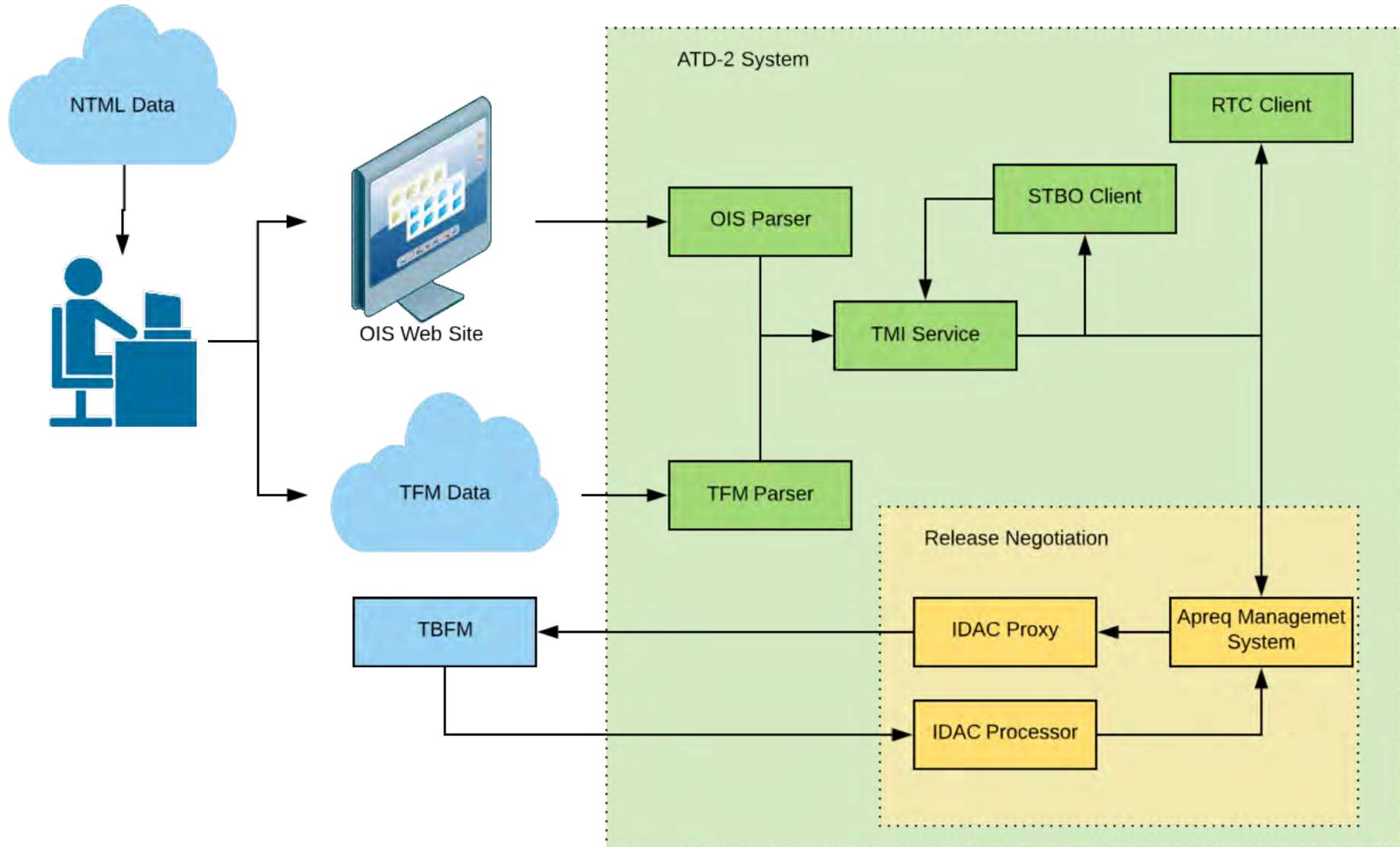
Latest IADS capabilities
Surface Metering - Initial Analysis, Impact, and Evolution

Mar. 14, 8:00-9:30 PT
Mar. 21, 8:00-9:30 PT

- The audio and video from this demo are being recorded



**RECORDING
IN PROGRESS**



- Web page managed by ATCSCC that provides information about current restrictions in the NAS including:
 - APREQs
 - MITS
 - Fix Closures
- Accessible at <http://www.fly.faa.gov/ois> > Current Restrictions
- Filter by requesting and providing facilities



ATCSCC
OIS
SYSTEM

5/16/2018

OIS Main Menu

- ▣ [NAS Status](#)
- ▣ [Int'l Status](#)
- ▣ [East Directory](#)
- ▣ [West Directory](#)
- ▣ [Airport Layout](#)
- ▣ Severe WX
- ▣ OPS Plans
- ▣ National Playbook
- ▣ [Tier Info](#)
- ▣ [Current Restrictions](#)

Current Restrictions

This page refreshes every minute. Last updated Wed, 16 May 2018 14:42:58 UTC

View restrictions **requested by:**

(List shows only facilities that have requested current restrictions)

ALL

DCA

N90

PCT

PHL

View restrictions **provided by:**

(List shows only facilities that have provided current restrictions)

ALL

BWI

CLT

DCA

EWR

Reset

Submit

- Filtering includes CLT or DFW as providing facilities and all requesting facilities
- Scrape HTML data for all 5 columns of the OIS table to use during parsing/interpretation

Current Restrictions

This page refreshes every minute. Last updated Wed, 16 May 2018 14:46:39 UTC

REQUESTING	PROVIDING	RESTRICTION	START TIME	STOP TIME
ZDC	CLT/ZTL	APREQ CLT,ZTL to DCA via BARMY,KILNS JETS 1130-0130 ZDC:CLT,ZTL	05/16/2018 1130	05/17/2018 0130
ZDC	CLT/ZTL	APREQ CLT,ZTL to EWR via BARMY,KILNS JETS 1015-0130 ZDC:CLT,ZTL	05/16/2018 1015	05/17/2018 0130
ZDC	CLT/ZTL	APREQ CLT,ZTL to IAD via BARMY,KILNS JETS 1330-2100 ZDC:CLT,ZTL	05/16/2018 1330	05/16/2018 2100
ZDC	CLT/ZTL	APREQ CLT,ZTL to LGA via BARMY,KILNS JETS 1015-0130 ZDC:CLT,ZTL	05/16/2018 1015	05/17/2018 0130
ZJX	CLT/ZTL	CLT SOUTHBOUND 10MIT SINGLE STREAM 1300-1600 ZJX:ZTL,CLT	05/16/2018 1300	05/16/2018 1600

- Use the Restriction column from the OIS page to determine type
- Only looking for APREQs, MITs, and Fix Closures
- Looking for specific patterns and order of key words/phrases in the restriction text to detect the restriction type

- APREQ
 - _____ APREQ _____ to _____[start time]-[end time]_____
 - Example: **APREQ** CLT,ZTL **to** DCA via BARMY,KILNS JETS **1130-0130**
ZDC:CLT,ZTL
- MIT
 - _____[numeric value] MIT(or MINIT)_____
 - Example: CLT BARMY **15MIT** JETS 0230-0315 ZTL:CLT
- Fix Closures
 - _____STOP _____[start time]-[end time]_____
 - **STOP** ZTL,CLT to EWR,LGA via KILNS,BARMY **0010-0130** VOL:WX
ZDC:ZTL,CLT

- Use combination of the Providing, Restriction, Start Time and End Time columns from OIS page
- Example: APREQ CLT,ZTL to DCA via BARMY,KILNS JETS 1130-0130 ZDC:CLT,ZTL
 - Text is split into token phrases and interpreted:
 1. APREQ
 - Already know this is an APREQ. Not needed for interpretation.
 2. CLT,ZTL
 - Compared with the ‘Providing’ facility column from the OIS table
 - If one element matches, assign as the APREQ’s origin
 - **Origin = CLT**
 3. to DCA
 - Confirm with adaptation data that element following ‘to’ is a valid NAS element (airport, center, fix)
 - If so, assign as the resource for the APREQ
 - **Resource type = DCA (Airport)**
 4. via BARMY, KILNS JETS
 - Check that elements following ‘via’ are valid NAS elements, equipment type, or altitude level (AOA/AOB)
 - If so, assign as inclusions for the APREQ
 - **Inclusion = BARMY (Fix), KILNS (Fix), Jets (Equipment Type)**
 - If keyword is ‘EXCL’ instead of via, assign as exclusion
 5. 1130-0130
 - Use Start Time/End Time columns from the OIS table to set the start/end times in the APREQ. These text values are not needed for interpretation.
 6. ZDC:CLT,ZTL
 - Not needed for interpretation.

- Use combination of the Providing, Restriction, Start Time and End Time columns from OIS page
- Example: CLT BARMY 15MIT JETS 0230-0315 ZTL:CLT
 - Text is split into token phrases and interpreted:
 1. CLT
 - Compared with the 'Providing' facility column from the OIS table
 - If one element matches, assign as the MIT's origin
 - **Origin = CLT**
 2. BARMY
 - Confirm with adaptation data that element is a valid NAS element (airport, center, fix)
 - If so, assign as the resource for the MIT
 - **Resource = BARMY (Fix)**
 3. 15 MIT
 - Assign the numeric value preceding 'MIT' as the miles value
 - **Miles = 15**
 - If value had been MINIT, assign as Minutes
 4. JETS
 - Check that remaining elements are valid NAS elements, equipment type, or altitude level (AOA/AOB)
 - If so, assign as inclusions for the MIT
 - **Inclusion = Jets (Equipment Type)**
 - If keyword 'EXCL' precedes element, assign as exclusion
 5. 0230-0315
 - Use Start Time/End Time columns from the OIS table to set the start/end times in the MIT. These text values are not needed for interpretation.
 6. ZTL:CLT
 - Not needed for interpretation.

- Use combination of the Providing, Restriction, Start Time and End Time columns from OIS page
- Example: STOP ZTL,CLT to EWR,LGA via KILNS,BARMY 0010-0130 VOL:WX ZDC:ZTL,CLT
 - Text is split into token phrases and interpreted:
 1. STOP
 - Already know this is a closure. Not needed for interpretation.
 2. ZTL,CLT
 - Compared with the 'Providing' facility column from the OIS table
 - If one element matches, assign as the closure's origin
 - **Origin = CLT**
 3. to EWR,LGA
 - If this value were to match the origin (i.e. to CLT), do nothing.
 - If this value matches other NAS elements, assign as an inclusions to the closure.
 - **Inclusions = EWR (Destination Airport), LGA (Destination Airport)**
 4. via KILNS,BARMY
 - Check that elements following 'via' are valid fixes
 - If so, assign as resources for the closure. When the closure reaches the TMI Service, they will be split into separate fix closures (maintaining identical start/end times and inclusions/exclusions).
 - **Resources = KILNS (Fix), BARMY (Fix)**
 - If element matches a Departure Gate instead (EAST, WEST, etc), separate fix closures will be created for each fix included in that gate.
 5. 0010-0130
 - Use Start Time/End Time columns from the OIS table to set the start/end times in the closure. These text values are not needed for interpretation.
 6. VOL:WX
 - Not parsing reasons for closures. Not needed for interpretation.
 7. ZDC:ZTL,CLT
 - Not needed for interpretation.

- Parsed and interpreted data is stored in XML files for reference
- Contains original text from OIS page as well as interpreted data for comparison

Scraped OIS Data

```
<ois-envelope timestamp="2018-05-16T15:00:06.871Z">
  <current-restrictions>
    <restriction requesting="ZDC" providing="CLT/ZTL" start-time="2018-05-16T11:30:00.000Z" stop-time="2018-05-17T01:30:00.000Z">
      <text>APREQ CLT,ZTL to DCA via BARMY,KILNS JETS 1130-0130 ZDC:CLT,ZTL</text>
    </restriction>
  </current-restrictions>
  <apreq-restrictions>
```

Interpreted Data

```
    <apreq-restriction start-time="2018-05-16T11:30:00.000Z" stop-time="2018-05-17T01:30:00.000Z">
      <requesting name="ZDC" type="CENTER"/>
      <providing name="CLT" type="AIRPORT"/>
      <providing name="ZTL" type="CENTER"/>
      <origins>
        <origin name="CLT" type="AIRPORT"/>
      </origins>
      <equipment-type>J</equipment-type>
      <text>APREQ CLT,ZTL to DCA via BARMY,KILNS JETS 1130-0130 ZDC:CLT,ZTL</text>
      <constraints>
        <constraint constraintAction="INCLUDE" constraintType="NAS_ELEMENT">
          <constraintValues>
            <constraintValue>FIX:BARMY</constraintValue>
            <constraintValue>FIX:KILNS</constraintValue>
          </constraintValues>
        </constraint>
      </constraints>
      <remove>false</remove>
      <resource-type>DESTINATION</resource-type>
      <destinations>
        <destination name="DCA" type="AIRPORT"/>
      </destinations>
    </apreq-restriction>
  </apreq-restrictions>
  <mit-restrictions/>
  <closures/>
</ois-envelope>
```

- Restriction column in OIS table is free text entry
 - Typos in keywords
 - Keywords out of expected order (i.e. start/end time values before APREQ/MIT keyword when they are expected after)
- Not all restrictions are available from OIS
- Not all airports/centers publish data to OIS
- OIS page does not display future restrictions
 - Only shows those already started
- Lag time between when a restriction goes into effect and when it shows on the OIS page
- Occasional OIS page down time results in missing restrictions

- TFM Flow data provides added value to the OIS TMI data

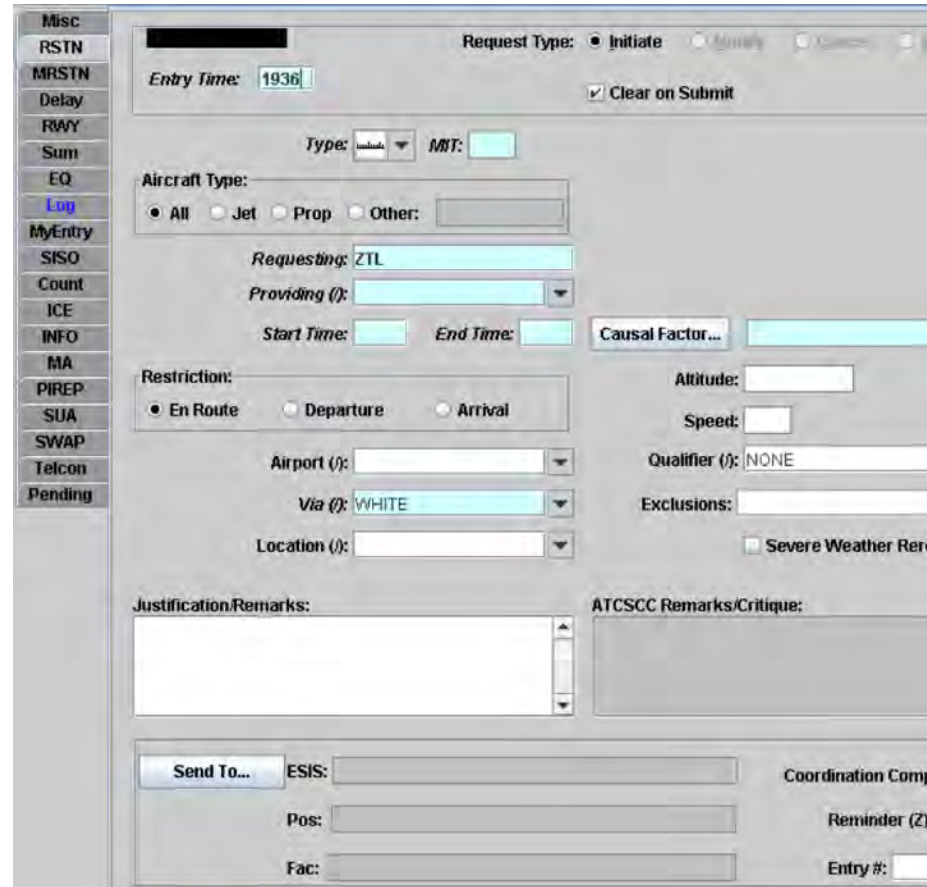
- Restrictions (Type=RSTR)
 - MIT/MINIT
 - Fix Closure (STOP)
 - TBM/DSP
 - ALT/SPD
- General Advisories (Type=GADV)
 - Reroutes
 - GDP/GS/AFP

Facility	RSTR	MIT	MINIT	STOP	TBM	DSP	ALT	SPD	SW
N90	5590	3002	1637	14	295	642	0	1	12
PCT	4504	4389	0	114	0	1	3	6	42
PHL	1758	1288	0	31	337	102	0	0	22
EWR	1496	16	949	19	238	274	0	1	5
LGA	1493	13	948	16	237	279	0	1	10
HPN	1040	13	548	15	238	226	0	0	10
TEB	979	12	531	19	238	179	0	1	6
JFK	959	462	3	13	237	244	0	1	6
SCT	932	901	16	14	0	1	243	0	4
D21	801	785	0	16	0	0	19	2	14
DCA	691	622	0	68	0	1	0	1	27
NCT	558	524	0	0	34	0	2	0	0
IAD	412	343	0	68	0	1	0	1	29
I90	391	382	9	0	0	0	0	15	0
BWI	375	321	0	53	0	1	0	1	21
ATL	267	252	4	11	0	0	0	0	8
F11	214	214	0	0	0	0	8	0	0
LAS	202	196	0	6	0	0	0	2	1
CLT	154	111	1	41	1	0	0	0	12
MSP	107	107	0	0	0	0	32	0	0
IND	104	104	0	0	0	0	50	0	0

Restriction messages by facility, Sep-Nov 2017

Some messages had multiple types in the same message (e.g. MIT and SPD), A facility was counted if it was requesting or providing, excluded DCC and ARTCCs.

- The process of TMIs getting to TFM Flow messages is currently being investigated (by observation at D10)
- In general, the process appears to be:
 - TRACON/ARTCC TMC determines need for TMI
 - Requesting facility TMC enters restriction in NTML using the Restriction Panel
 - Automation broadcasts the restriction via TFM Flow



The screenshot shows the 'Restriction Panel' interface. On the left is a vertical menu with options: Misc, RSTN, MRSTN, Delay, RWY, Sum, EQ, Log, MyEntry, SISO, Count, ICE, INFO, MA, PIREP, SUA, SWAP, Telcon, and Pending. The main panel contains the following fields and controls:

- Request Type:** Radio buttons for Initiate (selected), Amend, and Cancel.
- Entry Time:** Text field with value '1936'.
- Clear on Submit:** Checked checkbox.
- Type:** Dropdown menu.
- MT:** Text field.
- Aircraft Type:** Radio buttons for All (selected), Jet, Prop, and Other.
- Requesting:** Text field with value 'ZTL'.
- Providing (I):** Dropdown menu.
- Start Time:** Text field.
- End Time:** Text field.
- Causal Factor...:** Text field.
- Restriction:** Radio buttons for En Route (selected), Departure, and Arrival.
- Altitude:** Text field.
- Speed:** Text field.
- Airport (I):** Dropdown menu.
- Qualifier (I):** Text field with value 'NONE'.
- Via (I):** Dropdown menu with value 'WHITE'.
- Exclusions:** Text field.
- Location (I):** Dropdown menu.
- Severe Weather Rep:** Checked checkbox.
- Justification Remarks:** Large text area.
- ATCSCC Remarks/Critique:** Large text area.
- Send To...:** Button.
- ESIS:** Text field.
- Coordination Comp:** Text field.
- Pos:** Text field.
- Reminder (Z):** Text field.
- Fac:** Text field.
- Entry #:** Text field.

- TFM Flow restriction messages are in xml, with fields apparently corresponding to the text entry fields in the NTML Restriction Panel
- “mitNumber” is an encoded value indicating the requesting and providing facility types as well as the type of restriction (MIT, MINIT, STOP, DSP, etc.)

```
<ds:fiOutput><fi:fiMessage refresh="RFRS" sensitivity="A" destinationCodes="ALL"
sourceFacility="DCC" sourceTimeStamp="2017-09-02T22:29:42Z"
msgType="RSTR"><fi:restrictionMessage>
  <fcm:eventTime>2017-09-02T22:28:00Z</fcm:eventTime>
  <fcm:entryTime>2017-09-02T22:29:00Z</fcm:entryTime>
  <fcm:facility>DCC</fcm:facility>
  <fcm:action>6</fcm:action>
  <fcm:restrictionId>7160780</fcm:restrictionId>
  <fcm:restrictedNasElements>EWR</fcm:restrictedNasElements>
  <fcm:startTime>2017-09-02T21:30:00Z</fcm:startTime>
  <fcm:stopTime>2017-09-03T00:00:00Z</fcm:stopTime>
  <fcm:airports>EWR</fcm:airports>
  <fcm:aircraftType>ALL</fcm:aircraftType>
  <fcm:restrictionType>3</fcm:restrictionType>
  <fcm:mitNumber>278656</fcm:mitNumber>
  <fcm:mitValue>0</fcm:mitValue>
  <fcm:altitude> </fcm:altitude>
  <fcm:speed>0</fcm:speed>
  <fcm:reasonText>VOL:Volume</fcm:reasonText>
  <fcm:impactedElements> </fcm:impactedElements>
  <fcm:qualifier>NONE</fcm:qualifier>
  <fcm:passback>N</fcm:passback>
  <fcm:exclusions> </fcm:exclusions>
  <fcm:approvalTime>2017-09-02T22:28:00Z</fcm:approvalTime>
  <fcm:providerStatus>ZBW/7/£ZOB/7/£ZDC/7/£ZNY/7/£PHL/0/£</fcm:providerStatus>
  <fcm:referenceRestrictionEndTime>2017-09-03T00:00:00Z</fcm:referenceRestrictionEndTime>
  <fcm:referenceRestrictionId>7159345</fcm:referenceRestrictionId>
  <fcm:remarks>EWR CONFIGURATION CHANGE: RWY 4R FOR ARRIVALS ONLY.</fcm:remarks>
</fi:restrictionMessage></fi:fiMessage></ds:fiOutput></ds:tfmDataService>
```

- TFM Flow general advisory messages have a similar format as FAA's advisory database
- Some advisories are manually entered or edited, and can contain complicated conditional statements or typos

```
<ds:fiOutput><fi:fiMessage refresh="RFRS"
sensitivity="A" destinationCodes="ALL"
sourceFacility="TSS" sourceTimeStamp="2017-10-
14T14:13:19Z" msgType="GADV">
<fi:generalAdvisory>
<fcm:advisoryNumber>0039</fcm:advisoryNumber>
<fcm:origin>ATCSCC</fcm:origin>
<>2017-10-14T14:13:19Z</fcm:dateSent>
<fcm:facifcm:dateSentlitities>ZDV</fcm:facilities>
<fcm:effectivePeriod>
  <fce:startTime>2017-10-14T14:13:19Z</fce:startTime>
  <fce:endTime>2017-10-14T16:00:00Z</fce:endTime>
</fcm:effectivePeriod>
<fcm:advisoryTitle>ATCSCC ADVZY 039 DEN/ZDV 10/14/2017
DEN CAT I AND CAT II GROUND STOP</fcm:advisoryTitle>
<fcm:advisoryText>EVENT TIME 14/1410 14/1530
CONSTRAINED FACILITIES ZDV
FACILITIES INCLUDED ZDV 1ST TIER
REASON DEN RVR ARE CURRENTLY BELOW CAT I AND CAT II
MINS, FLUCTUATING BETWEEN 500 AND 1000 FT
USERS CAN EXPECT LIMITED AIRBORNE HOLDING AND POSSIBLE
DEPARTURE DELAYS UNTIL VISIBILITY INCREASES, CLEARING
EXPECTED BY 1530Z
141413141600
17/10/14 1413 DCCOPSlxstn38</fcm:advisoryText>
</fi:generalAdvisory></fi:fiMessage></ds:fiOutput>
```

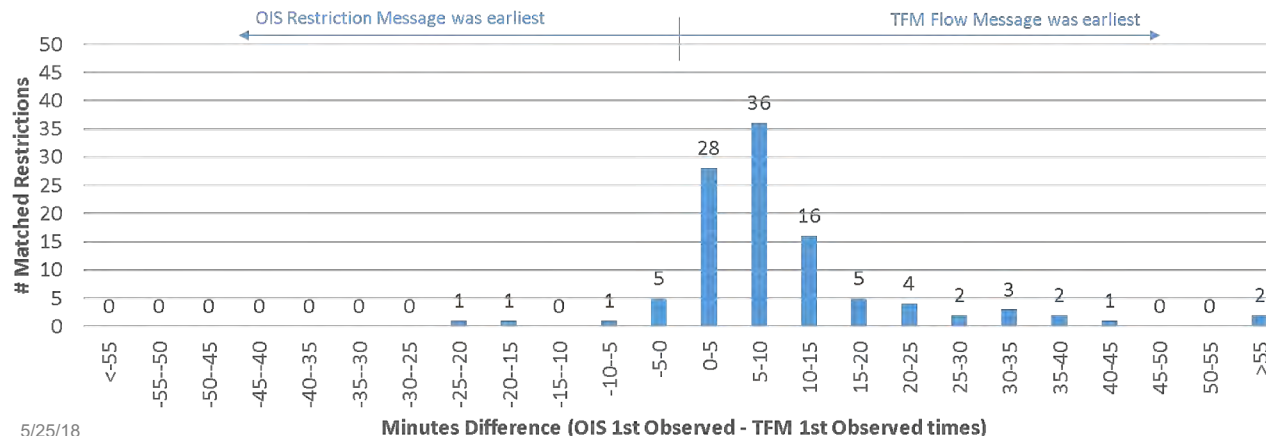
```
<ds:fiOutput><fi:fiMessage refresh="RFRS"
sensitivity="A" destinationCodes="ALL"
sourceFacility="TSS" sourceTimeStamp="2017-09-
02T19:48:13Z" msgType="GADV"><fi:generalAdvisory>
<fcm:advisoryNumber>0044</fcm:advisoryNumber>
<fcm:origin>ATCSCC</fcm:origin>
<fcm:dateSent>2017-09-02T19:48:13Z</fcm:dateSent>
<fcm:facilities>ZDC ZNY ZOB ZBW CYHZ CYOW CYUL CYYZ
CYTZ CYQB</fcm:facilities>
<fcm:effectivePeriod>
  <fce:startTime>2017-09-02T19:47:56Z</fce:startTime>
  <fce:endTime>2017-09-02T22:00:00Z</fce:endTime>
</fcm:effectivePeriod>
<fcm:advisoryTitle>ATCSCC ADVZY 044 PHL/ZNY 09/02/2017
CDM GROUND STOP</fcm:advisoryTitle>
<fcm:advisoryText>
CTL ELEMENT PHL
ELEMENT TYPE APT
ADL TIME 1943Z
GROUND STOP PERIOD 02/1933Z 02/2100Z
DEP FACILITIES INCLUDED Manual ZDC ZNY ZOB ZBW CYHZ
CYOW CYUL CYYZ CYTZ CYQB
PREVIOUS TOTAL, MAXIMUM, AVERAGE DELAYS 0 / 0 / 0
NEW TOTAL, MAXIMUM, AVERAGE DELAYS 885 / 80 / 47
PROBABILITY OF EXTENSION LOW
IMPACTING CONDITION WEATHER / LOW CEILINGS
COMMENTS
021947022200
17/09/02 1948 DCCOPSlxstn25</fcm:advisoryText>
</fi:generalAdvisory></fi:fiMessage></ds:fiOutput>
```


TMI	OIS	TFM Flow	NTML
Airport Information	NO	YES	YES
Airspace Flow Programs	NO	YES	YES
Ground Delay Programs	NO	YES	YES
Ground Stops	NO	YES	YES
Miles/Minutes in Trail	YES	YES	YES
Altitude Restrictions	YES	YES	YES
APREQs	YES	NO	YES
Advisories	NO	YES	YES
Closures (Fixes, etc.)	YES	YES	YES
FADT	NO	YES	NO
RAPT	NO	YES	NO
CTOP	NO	YES	NO
DICE	NO	YES	NO
REROUTEs	NO	YES	NO
TMI FLIGHT LIST	NO	YES	NO

- A source comparison was conducted, looking at several days' data from the OIS restrictions page, TFM Flow, and NTML entries
- A combination of OIS restrictions page and TFM Flow data was the recommended source

Later, comparison between TFM Flow and the OIS restrictions page revealed restrictions in TFM Flow messages typically arrived several minutes before the appearing OIS restrictions page. Also, that restrictions only appeared on the OIS page at or after the restriction start time.

Difference Between TFM and OIS
September - November 2017



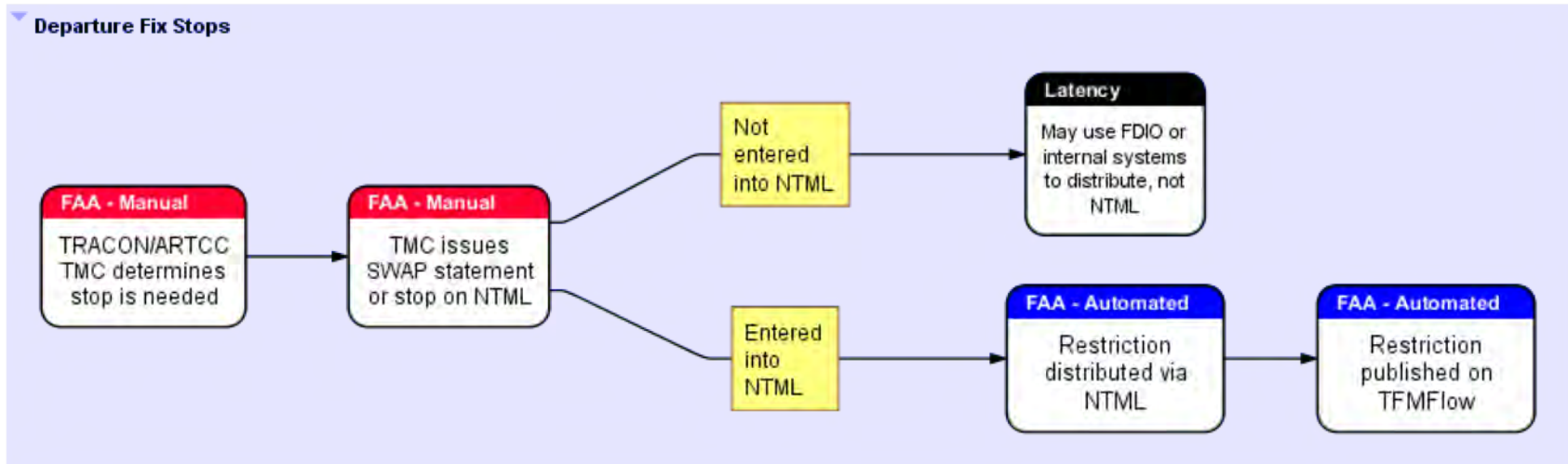
- APREQs are not currently observed in TFM Flow.
- Manual entry of the restrictions can result in typos that cause difficulties in parsing or dropped data.
- If TMLs are not entered into NTML, they may not end up in TFM Flow. FDIO, phone, or internal systems may be used to distribute TML information.
- If ATC makes a free text log entry rather than using NTML's restriction panel, the automated publishing of the restriction data may not happen.
- Ground Stop advisories are usually generated automatically when a Ground Stop is entered into FSM. However, some stops are initiated verbally with a free-text advisory manually created. These stops will not follow the same format as the automated Ground Stop advisories.

ATCSCC Advisory	
ATCSCC ADVZY 053 DEN/ZDV 11/06/2017 DEN CAT I GROUND STOP	
MESSAGE:	EVENT TIME: 06/1345 - 1500 DESTINATION AIRPORT: DEN FACILITIES INCLUDED: ZDV 2ND TIER ARTCC'S EXPECT UPDATE: 1500Z REASON: DEN RVR CURRENTLY AT CAT II AND III MINS, FLUCTUATING BETWEEN 1200AND 1400 FT. USERS CAN EXPECT LIMITED AIRBORNE HOLDING AND POSSIBLEDEPARTURE DELAYS UNTIL VISIBILITY INCREASES, CLEARING EXPECTED BETWEEN 1400-1600Z. THIS ADVISORY CANCELS AND REPLACES ADVISORIES 043 ADN 045. EFFECTIVE TIME: 061346 - 061530 SIGNATURE: 17/11/06 13:46

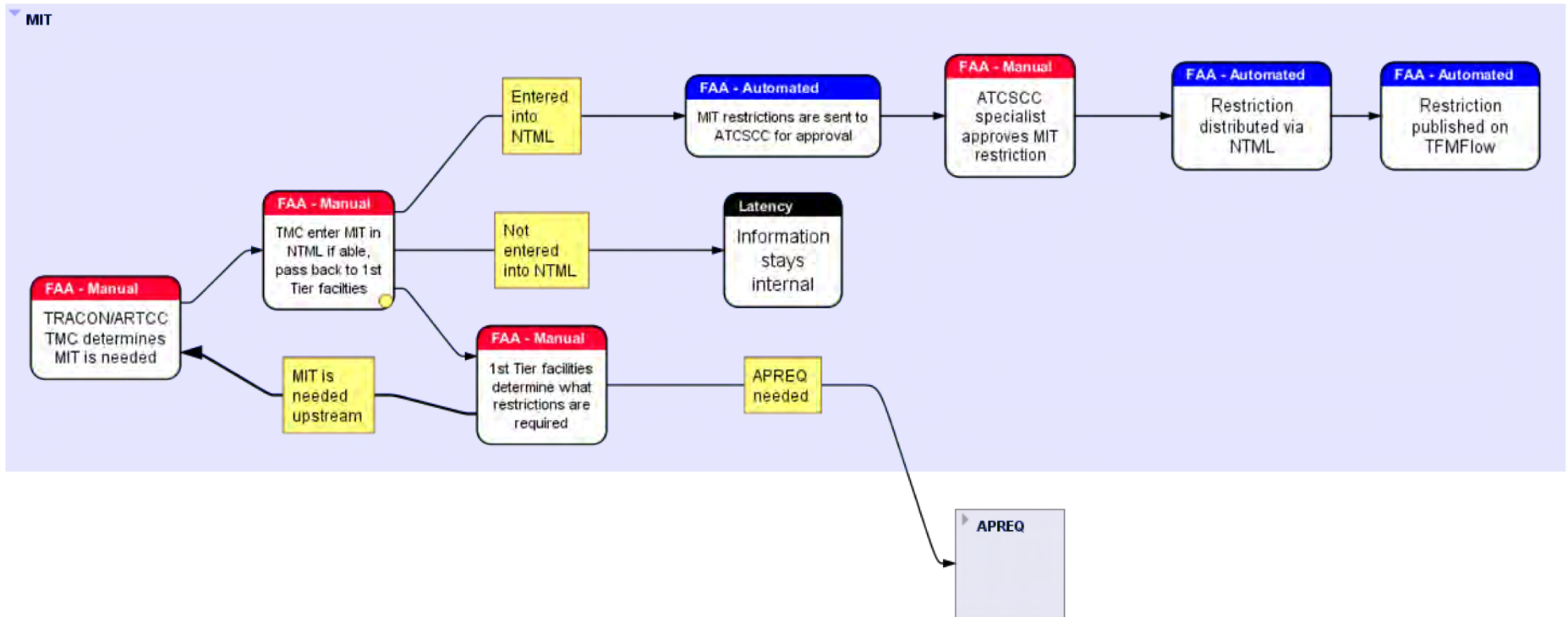
Example of Manual Ground Stop Advisory

ATCSCC Advisory	
ATCSCC ADVZY 052 PHL/ZNY 11/06/2017 CDM GROUND STOP	
MESSAGE:	CTL ELEMENT: PHL ELEMENT TYPE: APT ADL TIME: 1340Z GROUND STOP PERIOD: 06/1330Z - 06/1500Z DEP FACILITIES INCLUDED: (Manual) ZDC ZNY ZOB ZBW CYHZ CYOW CYUL CYYZ CYTZ CYQB PREVIOUS TOTAL, MAXIMUM, AVERAGE DELAYS: 0 / 0 / 0 NEW TOTAL, MAXIMUM, AVERAGE DELAYS: 946 / 86 / 59 PROBABILITY OF EXTENSION: MEDIUM IMPACTING CONDITION: WEATHER / WIND COMMENTS: EFFECTIVE TIME: 061343 - 061600 SIGNATURE: 17/11/06 13:43

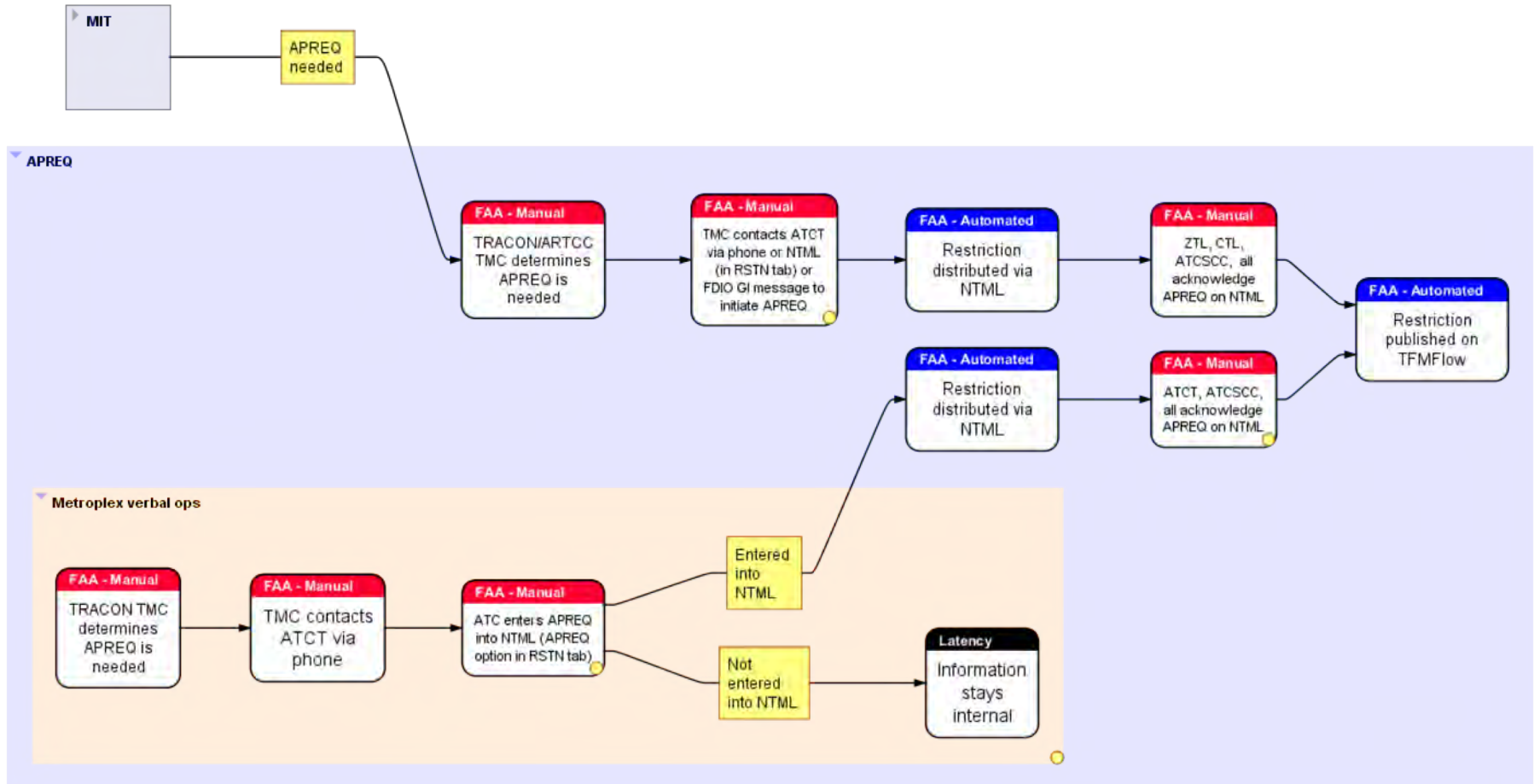
Example of Automated Ground Stop Advisory



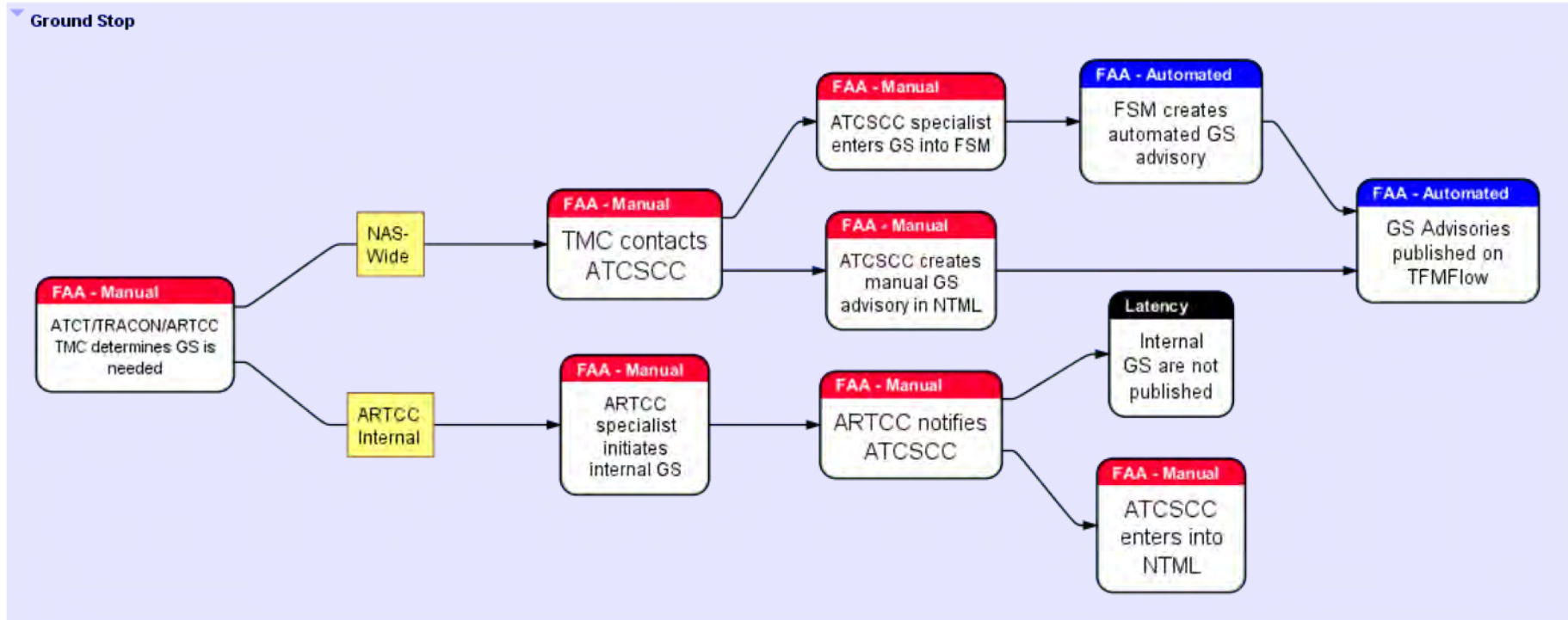
Note: Process to get to TFM Flow is still being verified through observation



Note: Process to get to TFM Flow is still being verified through observation



Note: Process to get to TFM Flow is still being verified through observation



Note: Process to get to TFM Flow is still being verified through observation

- Used to process, store, and distribute TMI's throughout the IADS system.
- Keeps TMI's in sync throughout the system without each individual component having to track additions, updates, and removals.
- Handles the following TMI data:

TMI Type	Possible Sources
APREQs	OIS, User
MITs	OIS, User
Ground Stops	TFM, User
Fix Closures	OIS, User
Runway Closures	User
Jet Route Closures	User
Taxiway Closures	User
Scheduled Metering Modes	User
Departure Metering Programs	Scheduler
Airport Configurations	User, Model
Runway Rate Restrictions	User

- Proposed Actions
 - OIS, TFM, and User entered data are sent to TMI Service with PROPOSED Actions
 - PROPOSED_ADD
 - PROPOSED_UPDATE
 - PROPOSED_REMOVE
 - TMI Service processes the data according to the PROPOSED action.
 - If accepted, TMI is distributed to other components with finalized action.
- Finalized Actions
 - TMIs with these actions are only distributed by the TMI Service
 - ADD
 - UPDATE
 - REMOVE
 - Other components in the IADS system receive the TMIs for these finalized actions to react accordingly (update displays, trigger scheduling, etc).

- Additions from OIS
 - OIS page is scraped for current restrictions every 30 seconds.
 - If resource and start time of a current OIS restriction matches a current restriction or recently removed restriction in the TMI Service, it is not re-added.
 - Start times are matched within 15 minutes of each other to prevent duplicates between user and OIS added TMIs.
- Additions from TFM
 - If resource and start time of a current TFM ground stop matches a current or recently removed ground stop in the TMI Service, it is not re-added.
- User Added Restrictions
 - Also checked for matching resource and start time (within 15 minutes) of current TMIs.
 - If match is found, the addition is handled as an update instead.
 - If matches found against recently removed restriction, it is allowed to be re-added by the user.

- Updates from OIS
 - When OIS data is scraped and compared to current restrictions, check for updates in any matches found.
 - Updates will only be applied for inclusion/exclusions, MIT values, and end times.
- Updates from TFM
 - If resource and start time of a current TFM ground stop matches a current ground stop in the TMI Service, inclusions/exclusions and end time may be updated.
- Updates from User Action
 - Users can only update restrictions that were originally user-added
 - Current restrictions
 - Can only update the end time, MIT value, and the inclusions/exclusions.
 - Future restrictions
 - Can update start time, end time, MIT value, and inclusions/exclusions.

- Removals from OIS
 - When OIS data is parsed, it is compared to the previous batch of parsed restrictions.
 - If any are no longer included in the parsed data that were in the previous batch, the TMI Service will remove the restriction.
- Removals from TFM
 - If a cancellation message is received for a ground stop, the TMI Service will remove the ground stop.
- User Removals
 - Users may remove any current or future restriction from the client.
 - Once removed, it will not be re-added through OIS or TFM.
 - The user may manually re-add it if needed.
- Automatic Removals
 - Once the end time of a TMI has passed, the TMI Service will remove the TMI.
 - An automatic reset will run daily at 08:00 GMT to clear out any remaining TMIs.

- Binding triggers
 - TMI's are added or updated
 - Flights are added, updated, or removed from the system
- Flight Criteria
 - Flight undelayed targeted take off time (UTOT), or best available runway time is between start/end time of the TMI
 - Chose to use undelayed time since it is not changed by model/scheduler.
 - This prevents possibility of flight times repeatedly changing over the threshold for inclusion and flip-flopping between inclusion and exclusion from the TMI.
 - Matches TMI resource
 - Uses destination resource specified in APREQs, Ground Stops, MITs
 - Uses departure fix specified in Fix Closures, MITs,
 - Uses runway/taxiway/jet route specified in Closures

- Every TMI supports a set of inclusion/exclusion constraints
- Constraints are used as a subset of criteria for binding a flight to a TMI
- Constraints are configurable per TMI
- Available constraints:
 - Altitude
 - Aircraft Type/Category
 - Airline
 - Airway
 - Callsign
 - Center
 - Diverted Flights
 - Destination
 - Fix
 - MIT/APREQ (conflicting restrictions)
 - User Category

- Example: APREQ CLT,ZTL to DCA via BARMY,KILNS JETS 1130-0130 ZDC:CLT,ZTL
- Parsed through OIS Connector and passed to TMI Service as XML:

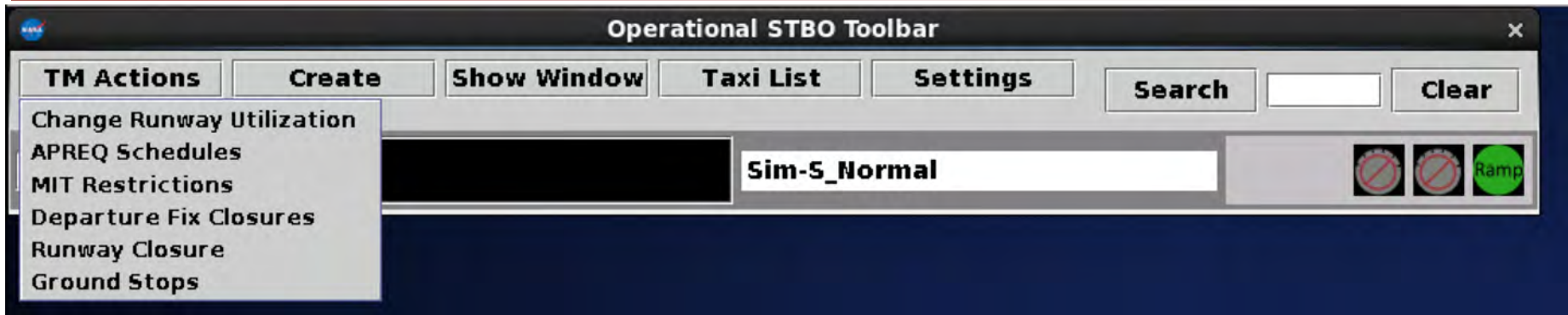
```
<ois-envelope timestamp="2018-05-16T15:00:06.871Z">
  <current-restrictions>
    <restriction requesting="ZDC" providing="CLT/ZTL" start-time="2018-05-16T11:30:00.000Z" stop-time="2018-05-17T01:30:00.000Z">
      <text>APREQ CLT,ZTL to DCA via BARMY,KILNS JETS 1130-0130 ZDC:CLT,ZTL</text>
    </restriction>
  </current-restrictions>
  <apreq-restrictions>
    <apreq-restriction start-time="2018-05-16T11:30:00.000Z" stop-time="2018-05-17T01:30:00.000Z">
      <requesting name="ZDC" type="CENTER"/>
      <providing name="CLT" type="AIRPORT"/>
      <providing name="ZTL" type="CENTER"/>
      <origins>
        <origin name="CLT" type="AIRPORT"/>
      </origins>
      <equipment-type>J</equipment-type>
      <text>APREQ CLT,ZTL to DCA via BARMY,KILNS JETS 1130-0130 ZDC:CLT,ZTL</text>
      <constraints>
        <constraint constraintAction="INCLUDE" constraintType="NAS_ELEMENT">
          <constraintValues>
            <constraintValue>FIX:BARMY</constraintValue>
            <constraintValue>FIX:KILNS</constraintValue>
          </constraintValues>
        </constraint>
      </constraints>
      <remove>false</remove>
      <resource-type>DESTINATION</resource-type>
      <destinations>
        <destination name="DCA" type="AIRPORT"/>
      </destinations>
    </apreq-restriction>
  </apreq-restrictions>
  <mit-restrictions/>
  <closures/>
</ois-envelope>
```

- OIS Interpreted XML data is converted to FMC format used by TMI Service:

```
<apreqRestriction>
  <action>PROPOSE_ADD</action>
  <constraints>
    <aircraftCategoryConstraint>
      <id>AC_CATb95f6f61-cfed-436b-8f4f-989ffa26d516</id>
      <type>AC_CAT</type>
      <action>INCLUDE</action>
      <source>OIS</source>
      <constraintValues>
        <constraintValue>JET</constraintValue>
      </constraintValues>
    </aircraftCategoryConstraint>
    <resourceConstraint>
      <id>FIX52598210-2955-403f-b09d-2d23714d9204</id>
      <type>FIX</type>
      <action>INCLUDE</action>
      <source>OIS</source>
      <constraintValues>
        <constraintValue>BARMY</constraintValue>
        <constraintValue>KILNS</constraintValue>
      </constraintValues>
    </resourceConstraint>
  </constraints>
  <endTime>2018-05-16T21:30:00-04:00</endTime>
  <entityKey type="AIRPORT">CLT</entityKey>
  <originalSource>OIS</originalSource>
  <scheduleSource>OIS</scheduleSource>
  <startTime>2018-05-16T07:30:00-04:00</startTime>
  <resourceName>DCA</resourceName>
  <resourceType>DESTINATION</resourceType>
</apreqRestriction>
```

- Converted FMC APREQ uses PROPOSE_ADD action type so that it will be processed correctly through the rest of the TMI Service

- FMC APREQ is checked against other APREQs already stored in the TMI Service
 - Looks for matches on other APREQs with DCA as the resource.
 - If found, those matches are checked to see if they start 0715-0745 (accounting for the 15 minute window on either side of the 0730 start time).
 - If found, APREQ is not added or distributed.
 - If not found, APREQ is assigned a unique add, action changed from PROPOSED_ADD to ADD, and distributed to the other components in the IADS system.
 - Once added, all flights in the system will be checked to see if they should be included:
 - Must be departure with DCA as the destination
 - Must have undelayed runway time between 0730-2130
 - Must meet inclusion criteria: assigned equipment type of JET and using either of the included departure fixes (KILNS, BARMY)
 - If all these criteria are met, the APREQ's unique ID will be assigned to the flight's restriction list to indicate that the flight is included in this particular APREQ.



- Traffic Management Action Panel
 - Utility to customize surface operations through restriction management
 - Augments OIS data
 - Accessible from the Operational STBO Toolbar
 - Schedule, Remove, and Modify TMI events
 - Supported TMI's
 - Runway Utilization
 - APREQ Schedules
 - MIT Restrictions
 - Departure Fix Closures
 - Runway Closures
 - Ground Stops

- The TM Action Panel only shows TMI's validated and approved by the TMI Service
- All actions are proposed to the TMI Service for validation and approval
- Schedule Limitations
 - TMI start time must be greater than or equal to the current time
 - TMI start time must not conflict with another TMI referencing the same resource
- Modify Limitations
 - Only 'user' entered TMI's are eligible for modification
 - Active TMI start time cannot be modified
 - TMI resource field cannot be modified

- Basic representation of TMI's
 - Resource
 - airport or flight characteristic that binds a flight to a TMI
 - e.g. airport, departure fix, runway, etc
 - Restriction
 - specific limitation(s) imposed on a flight
 - e.g. alternate fix, separation value, etc
 - Start Time
 - End Time
 - Constraints
 - Subset of airport or flight characteristics to refine the set of flights bound to a TMI

- Constraints are used to refine the criteria for binding a flight to a TMI
- Multiple constraints may be set as either inclusion or exclusion criteria
- The set of constraints types are AND'd together, while multiple values for a given type are OR'd together.
 - e.g. (exclude flights an MIT) AND (include flights where (departure fix is KILNS OR BARMY))
- Not all TMI's support constraints



APREQ Schedule Constraint Settings

Aircraft Type User Category Center Sector Airway Airline
 MIT Departure Fix Filed Altitude Weight Class Engine Type

☐ MIT

Set as: ☐ Inclusion ☐ Exclusion

Apply Cancel

STBO TM Actions

Runway Utilization | APREQ Schedule | MIT Restrictions | Dep Fix Closures | Runway Closures | Ground Stops

Add Runway Utilization

☒ VMC ☐ IMC

Configuration:

Runway Utilization:

Start Time: (dd/hhmm) ☒ Start Now

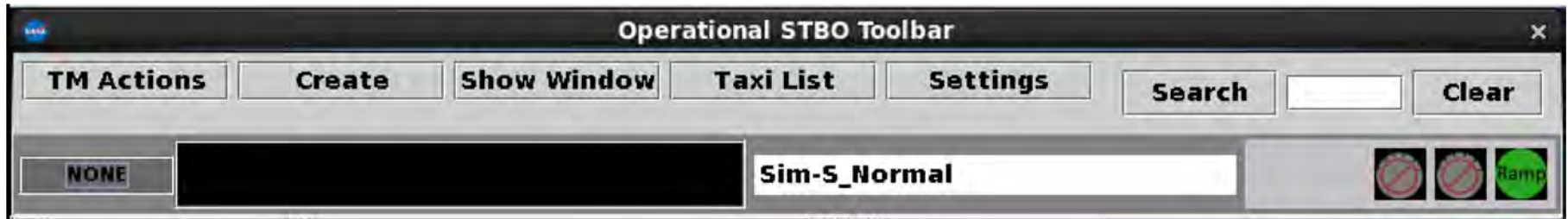
Time	Configuration	Scenario	VMC/IMC
15/1712	South_Sim	S_Normal	VMC

Clear All Add Remove Modify

Close Window

- Controls the surface arrival departure flow
- VMC/IMC: visual or instrument meteorological conditions
- Configuration: predefined set of runway groupings
- Runway Utilization: playbooks describing how the runways for a given configuration are to be used
- Start Time: time when the TMI becomes active
- End Time is not required because an airport must always have an active configuration, a configuration ends when the next scheduled configuration begins

- Impact to STBO Client
 - Flights will switch runways to reflect the configuration change
 - Toolbar will show active configuration and runway utilization



- Impact to RTC Client
 - Flight will switch runways to reflect the configuration change

STBO TM Actions

Runway Utilization | **APREQ Schedule** | MIT Restrictions | Dep Fix Closures | Runway Closures | Ground Stops

Add APREQ Schedule

☒ Airport ☐ Departure Fix ☐ Jet Route

Airport: **Select**

Start Time: (dd/hhmm) ☒ Start Now

End Time: (dd/hhmm) ☒ No End Time

Constraints: **Set**

APREQ Schedule

Resource	Start	End	Source
EWR	15/1000	16/0130	OIS
LGA	15/1015	16/0130	OIS
DCA	15/1100	16/0130	OIS
IAD	15/1400	15/2100	OIS
DFW	15/1809	15/1945	OIS

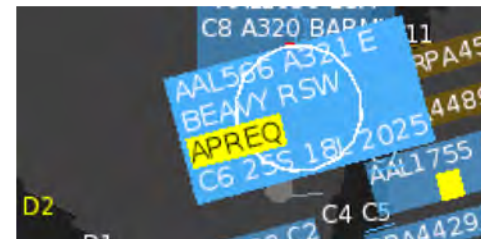
Clear All **Add** **Remove** **Modify** **View Constraints** **Close Window**

- Schedules resources requiring an approval request or call for release
- Select the type of resource to be constrained (Airport, Departure Fix, Jet Route)
- Start Time: time when the TMI begins
- End Time: time when the TMI expires
- Constraints: sub restrictions for a resource

- Impact to STBO Client
 - Flights marked as APREQ constrained on timelines and map



- Impact to RTC Client
 - Flight strips marked as APREQ constrained



STBO TM Actions

Runway Utilization

APREQ Schedule

MIT Restrictions

Dep Fix Closures

Runway Closures

Ground Stops

Add MIT Restrictions

☐ Airport

☒ Departure Fix

☐ Jet Route

Departure Fix:

MIT Restriction:

Start Time:

(dd/hhmm)

☒ Start Now

End Time:

(dd/hhmm)

☒ No End Time

Constraints:

Set

Clear All

Add

Remove

Modify

View Constraints

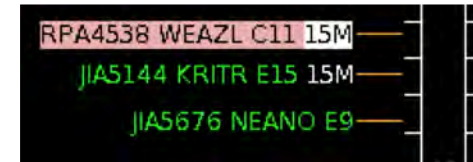
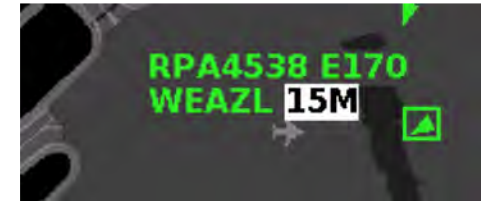
Close Window

MIT Restrictions

Resource	MIT	Start	End	Source
----------	-----	-------	-----	--------

- Schedules resources subject to Miles in Trail
- Select the type of resource to be constrained (Airport, Departure Fix, Jet Route)
- MIT Restriction: flight separation in nautical miles
- Start Time: time when the TMI begins
- End Time: time when the TMI expires
- Constraints: sub restrictions for a resource

- Impact to STBO Client
 - Display the nautical mile separation next to the flight on the timeline and datablock.



- Impact to RTC Client
 - Display the nautical mile separation as part of the flight strip



STBO TM Actions

Runway Utilization

APREQ Schedule

MIT Restrictions

Dep Fix Closures

Runway Closures

Ground Stops

Add Dep Fix Closures

Departure Fix:

CDR Flights To:

TBD

Start Time: (dd/hhmm) ☒ Start Now

End Time: (dd/hhmm) ☒ No End Time

Constraints:

Set

APREQ Schedule

Fix Closure	Flights to	Start	End	Source
-------------	------------	-------	-----	--------

Remove

Modify

View Constraints

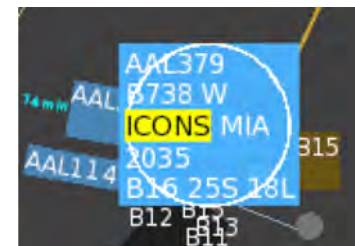
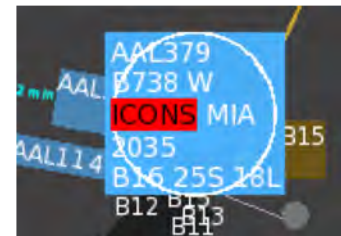
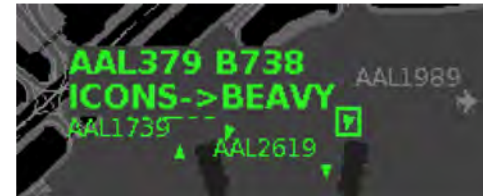
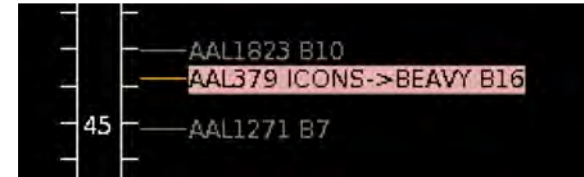
Clear All

Add

Close Window

- Schedules departure fix closures
- Departure Fix: name of the departure fix to close
- CDR Flights To: coded departure route, TBD (to be determined) or no alternate specified
- Start Time: time when the TMI begins
- End Time: time when the TMI expires
- Constraints: sub restrictions for a resource

- Impact to STBO Client
 - When CDR is not provided, the flights are rescheduled 2 hours later as there is no valid fix assigned to the flight
 - If a CDR is provided, flights remain at scheduled time on timeline and show FIX → CDR as part of the timeline and map datablock
- Impact to RTC Client
 - When CDR is not provided, continues to show closed fix highlighted red on the flight strip
 - When CDR is provided, continues to show previous fix on flight strip highlighted yellow on the flight strip. The flight property dialog shows both the previous and CDR fix.



DEPARTURE DETAILS	
Tail:	N315PE
P-Time:	2035
EOBT:	2035
TOBT:	
TMAT:	
APREQ:	
EDCT:	
MIT:	
Departure fix:	BEAVY
Previous fix:	ICONS

STBO TM Actions

Runway Utilization | APREQ Schedule | MIT Restrictions | Dep Fix Closures | **Runway Closures** | Ground Stops

Add Runway Closures

Runway:

Start Time: (dd/hhmm) ☒ **Start Now**

End Time: (dd/hhmm) ☒ **No End Time**

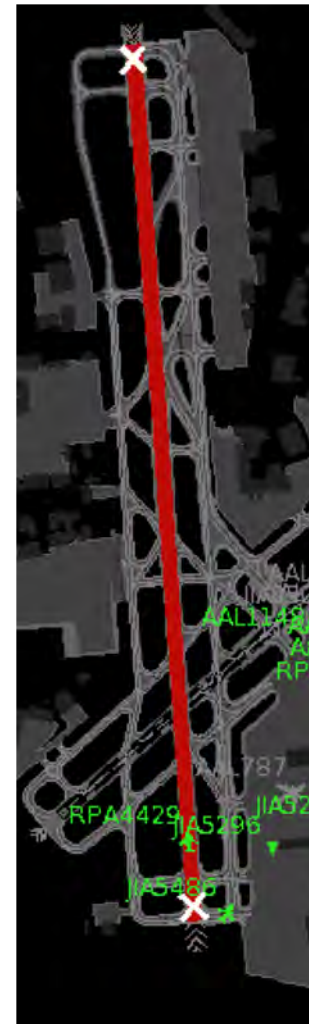
Runway Closures

Closed Runway	Start	End	Source

Clear All **Add** **Remove** **Modify** **Close Window**

- Schedules runway closures
- Opposites are automatically closed
- Runway: list of runways for the given airport
- Start Time: time when the TMI begins
- End Time: time when the TMI expires

- Impact to STBO Client
 - Flights will be automatically reassigned to another runway
 - Runway shows blocked out in red on STBO map
- Impact to RTC Client
 - Runway shows blocked out in red on RTC map



STBO TM Actions

Runway Utilization | APREQ Schedule | MIT Restrictions | Dep Fix Closures | Runway Closures | **Ground Stops**

Add Ground Stops

Airport: **Select**

Start Time: {dd/hhmm} ☒ **Start Now**

End Time: {dd/hhmm} ☒ **No End Time**

Constraints: **Set**

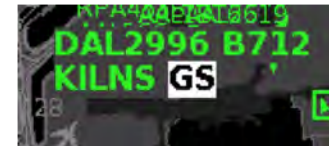
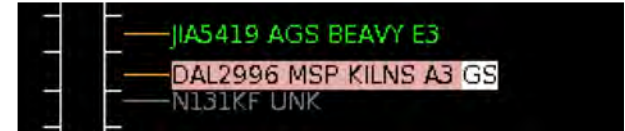
Ground Stops

Airport	Start	End	Source
CLT	15/1832	15/2000	TFM

Clear All **Add** **Remove** **Modify** **View Constraints** **Close Window**

- Schedules ground stop programs
- Select the airport running the ground stop program
- Start Time: time when the TMI begins
- End Time: time when the TMI expires
- Constraints: sub restrictions for a resource

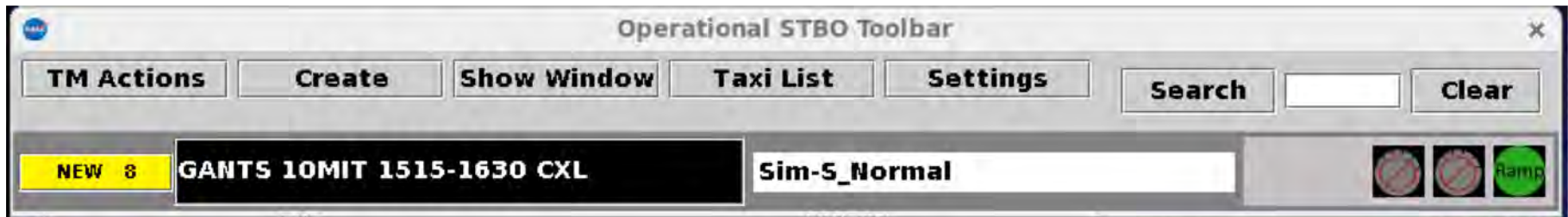
- Impact to STBO Client
 - If no end time is provided, the flight is removed from scheduling and disappears from the timeline
 - If an end time is provided, the flight will show 'GS' next to the timeline and map data blocks



- Impact to RTC Client
 - The flight strip will show the destination airport highlighted in red



- Integrated into the RTC and STBO toolbars
- Supports acknowledgement of TMI changes
 - Click the yellow button labeled “New #” to acknowledge updates.
 - Button will display as “None” if no updates to acknowledge
- Provides quick view of updates
 - Indicator of unacknowledged TMI's
 - Time-sharing view of unacknowledged TMI's
- Detailed table view of TMI's



Notifications					
Reported	Event Type	Description	Event Start	Event End	Details
5/16/18 1523	Fix	GIPPR 7MIT	5/16/18 1515	5/16/18 1630	OIS: EXCL PROP TURBO
5/16/18 1523	Fix	GANTS 7MIT	5/16/18 1515	5/16/18 1630	OIS: EXCL PROP TURBO
5/16/18 1523	Fix	PEKNN 7MIT	5/16/18 1515	5/16/18 1630	OIS: EXCL PROP TURBO
5/16/18 1523	Fix	KILNS 7MIT	5/16/18 1515	5/16/18 1630	OIS: EXCL PROP TURBO
5/16/18 1523	Fix	RUNIE 7MIT	5/16/18 1515	5/16/18 1630	OIS: EXCL PROP TURBO
5/16/18 1523	Fix	LILLS 7MIT	5/16/18 1515	5/16/18 1630	OIS: EXCL PROP TURBO
5/16/18 1523	Fix	BARMY 7MIT	5/16/18 1515	5/16/18 1630	OIS: EXCL PROP TURBO
5/16/18 1523	Fix	MERIL 7MIT	5/16/18 1515	5/16/18 1630	OIS: EXCL PROP TURBO
5/16/18 1508	TMI	APREQ to JFK	5/16/18 1500	5/17/18 0200	OIS: INCL JET BARMY KILNS
5/16/18 1441	TMI	APREQ to PHL	5/16/18 1130	5/16/18 1441	Cancelled
5/16/18 1410	Fix	BUCKL OPENED	5/16/18 1410		OIS: EXCL PROP TURBO
5/16/18 1410	Fix	BUCKL CLOSED	5/16/18 1319	5/16/18 1410	Cancelled
5/16/18 1410	Fix	TREAL OPENED	5/16/18 1410		OIS: EXCL PROP TURBO
5/16/18 1410	Fix	TREAL CLOSED	5/16/18 1319	5/16/18 1410	Cancelled
5/16/18 1410	Fix	ANDYS OPENED	5/16/18 1410		OIS: EXCL PROP TURBO
5/16/18 1410	Fix	ANDYS CLOSED	5/16/18 1319	5/16/18 1410	Cancelled

- Open detailed view by single clicking the time-shared text area on the toolbar
- Selecting any row will acknowledge all TMI's
- Colors
 - White: TMI has been acknowledged by the user
 - Yellow: TMI has been changed and waiting user acknowledgement
 - Blue: TMI expired before the scheduled end time

- Example

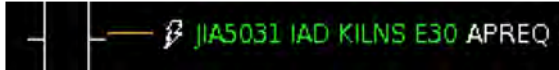
- Component Overview
 - IDAC Processor
 - Consumes and processes IDAC data
 - Source of negotiation data and states
 - IDAC Proxy
 - Hosts negotiation services
 - Interfaces with IDAC WSRT services
 - Apreq Management System (AMS)
 - Tracks negotiation state per flight
 - TBFM
 - Schedules flights into overhead stream

- Manual
 - Requires phone calls between Tower and Center
 - No network communication between Tower and Center
 - Release times must be manually entered by the Tower
 - Flight representation:



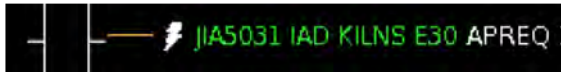
A screenshot of a flight display interface. It shows a list of flight data with columns for flight number, mode, and status. The first row is highlighted in green and contains the text: AAL581 MCO ICONS C8 APREQ. Above this row, the text 'PERMIT C8' is visible in a smaller font.

- Semi
 - No phone call between Tower and Center
 - Requests are sent to TBFM which must be approved by the Center
 - Responses from the Center are received through the IDAC data
 - Release times are automatically populated into the ATD2 system
 - Flight representation:



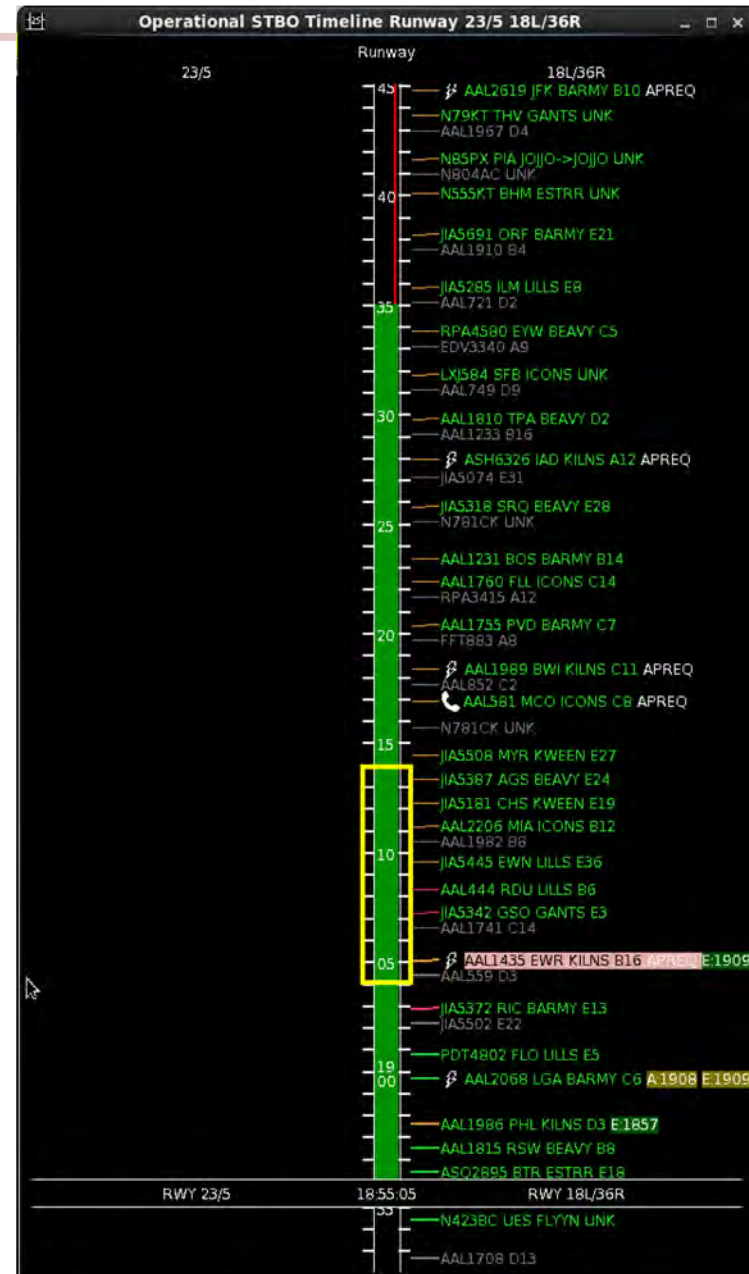
A screenshot of a flight display interface. It shows a list of flight data with columns for flight number, aircraft type, and status. The text 'JIA5031 IAD KILNS E30 APREQ' is visible in green, indicating a specific flight's status and location.

- Automatic
 - No phone call between Tower and Center
 - Requests are sent to TBFM and automatically scheduled and accepted
 - Responses from the Center are received through the IDAC data
 - Release times are automatically populated into the ATD2 system
 - Flight representation:

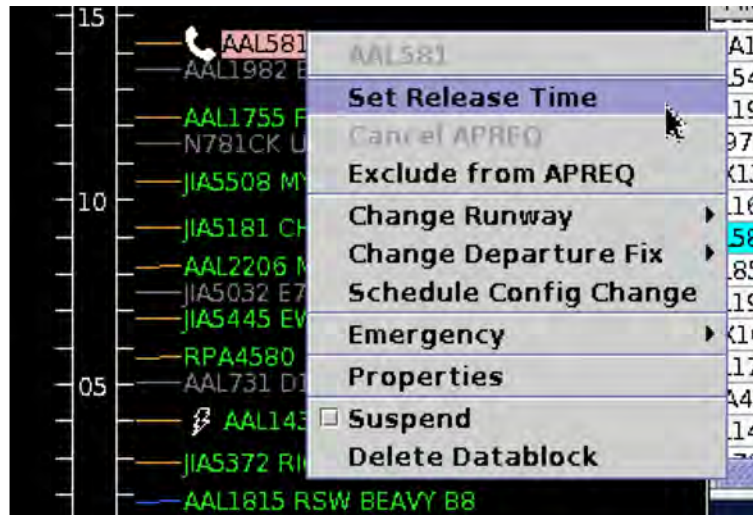


— ⚡ J1A5031 IAD KILNS E30 APREQ

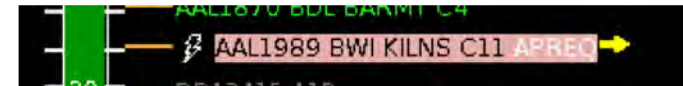
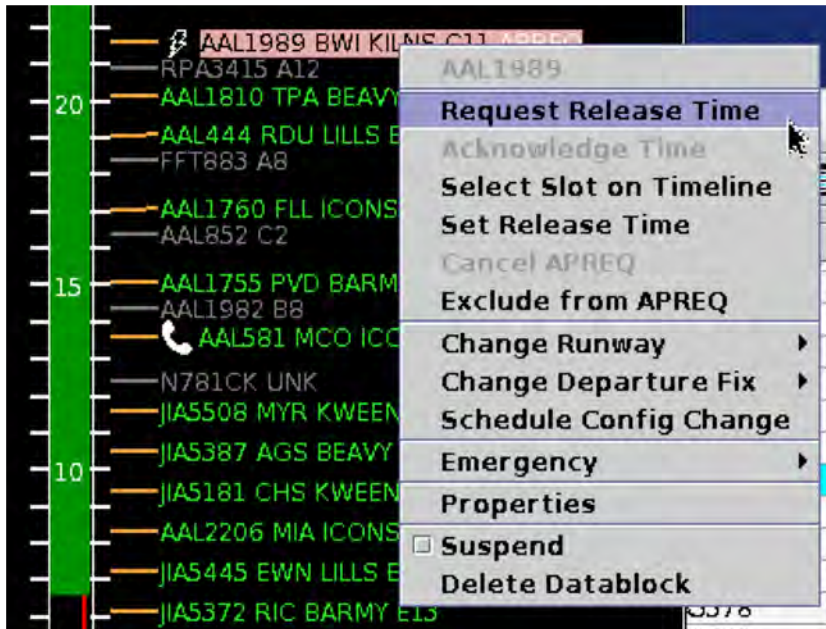
- Displays open space for scheduling
- 15 minutes before departure time
- 30 minutes after departure time
- Green space is available
- Red space is unavailable



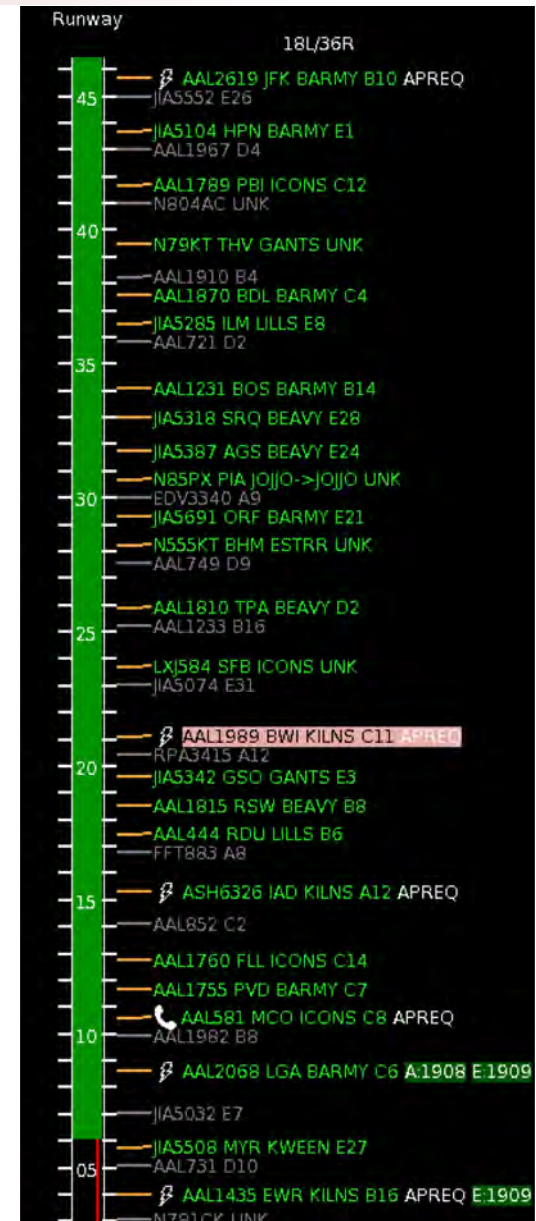
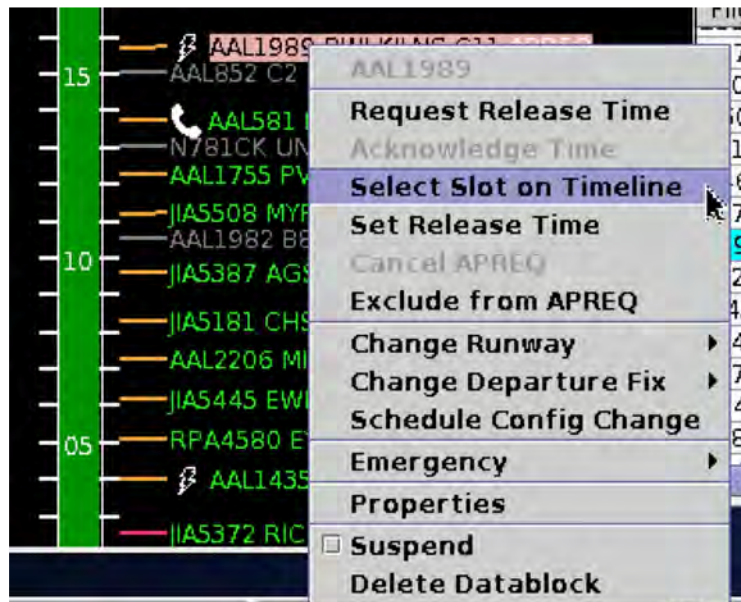
- Set Release
 - Tower controller must manually entered a negotiated release time
 - Modes: Manual, Semi, Auto



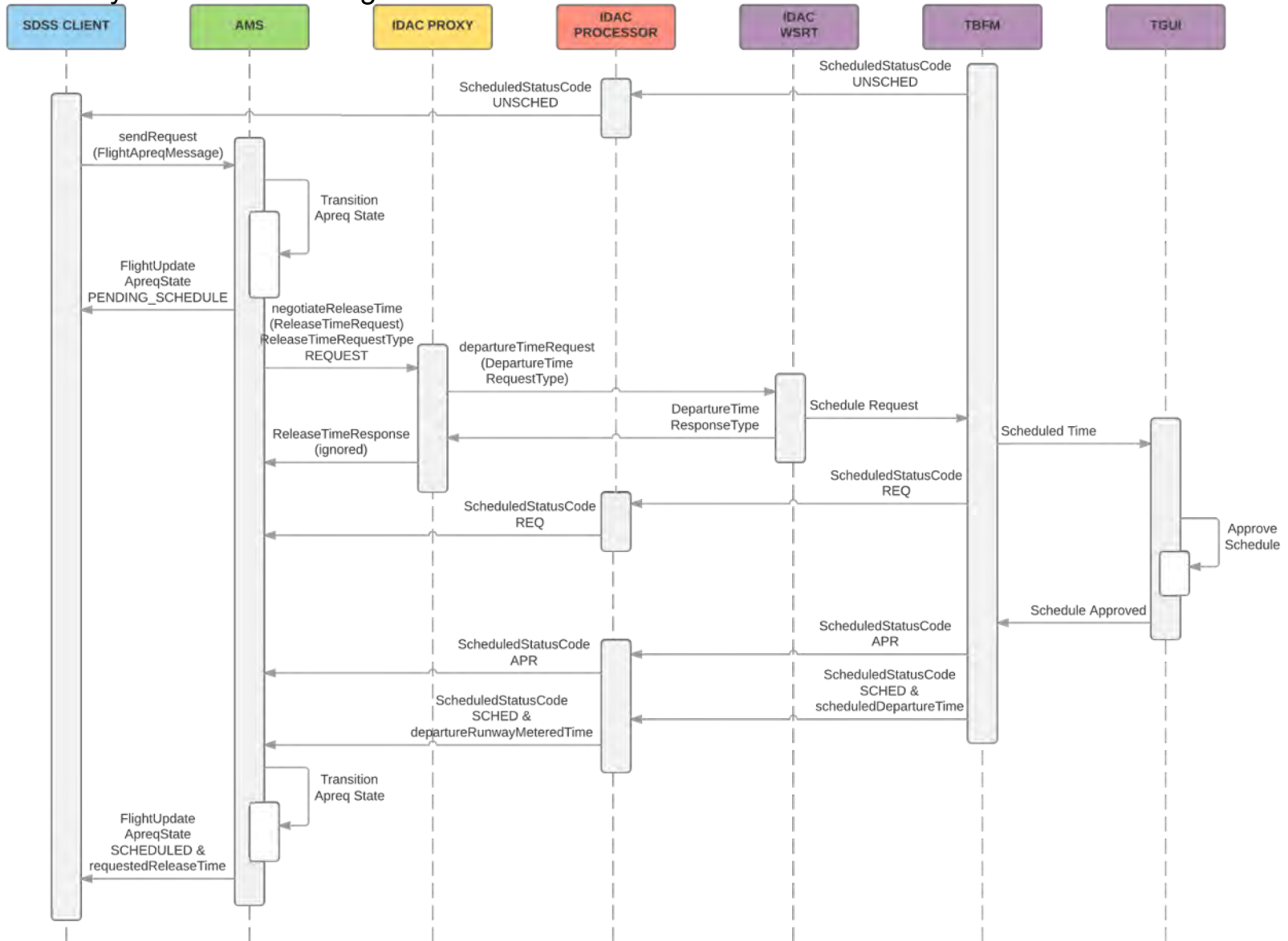
- Request Release Time
 - Flight scheduled departure runway time sent as the requested release time
 - Modes: Semi, Auto



- Select Slot on Timeline
 - Red/Green slots representing available space displayed on timeline
 - User select a time on the timeline. The user selected time is sent as the requested release time
 - Modes: Semi, Auto



- IDST style release time negotiation



- Example

- Free Release
- Release Time Rounding (support of TBFM 4.8)
- Automatic Negotiation when flight crosses into AMA

